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EXAMINER

YAMNITZKY, MARIE ROSE

ART UNIT

PAPER NUMBER

1774

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Please find below and/or attached an Office communication concerning this application or proceeding.

AS-3

# Office Action Summary

Application No.

09/747,933

Applicant(s)

Tatsuya IGARASHI et al.

Examiner

M. Yamnitzky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE three (3) MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 12/27/00 and 08/29/01
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above, claim(s) 3 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, and 4-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claims 1-9 are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some\* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_ 6) ☐ Other:

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1. This application contains claims directed to the following patentably distinct species of the claimed invention: a light emitting material and a light-emitting device comprising the material wherein the material comprises a compound having a partial structure represented by (a) formula (1), (b) formula (2), (c) formula (3), (d) formula (4), (e) formula (5), (f) formula (6), (g) formula (7), (h) formula (8), (i) formula (9), (j) formula (10), (k) formula (21), (l) formula (22), (m) formula (23) or (n) formula (24).

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claim 8 is generic. Claim 9 will also be treated as a generic claim although it is not clear to the examiner, based on the examples in the specification, if claim 9 is actually generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

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Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

2. During a telephone conversation with Mark Boland on 02/11/02, a provisional election was made without traverse to prosecute the invention of species (k) (i.e. a light-emitting material comprising a compound having a partial structure represented by formula (21) and a light-emitting device comprising the material). Claims 1, 2 and 5-9 read on the elected species. Affirmation of this election must be made by applicant in replying to this Office action. Claim 3 is withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected species.

Claim 4 has been examined because, in searching the elected species, a reference relevant to claim 4 was found. References applicable to other non-elected species were also found in the course of searching the elected species and are applied below. However, the election of species requirement remains in effect because it was not necessary to extend the search to cover all non-elected species in order to determine the patentability of the generic claims.

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3. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

4. Claims 1, 2, 5-7 and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 5, with claim 2 dependent from claim 1 and claims 6 and 7 dependent from claim 5: The description of  $Z^{11}$  and  $Z^{12}$  for formula (4) is not clear. The description of  $Z^{21}$  and  $Z^{22}$  for formula (7) is not clear. These descriptions allow "said ring" to form a condensed ring "with the other ring". It is not clear if this means that the ring formed in part by  $Z^{11}$  may condense with the ring formed in part by  $Z^{12}$ , and similarly that the ring formed in part by  $Z^{21}$  may condense with the ring formed in part by  $Z^{22}$ , or if there is some alternative meaning to this language.

Claim 9: The limitation regarding external quantum efficiency renders the claim indefinite because the conditions under which the external quantum efficiency must be 5% or more are not set forth in the claim. As evidenced, for example, by Baldo et al. in *Applied Physics Letters* 75(2), pp. 4-6, external quantum efficiency is not a constant for a specific device. See Figure 2 and the description bridging the two columns on page 5 of the Baldo article.

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Claim 9 is also grammatically unclear in reciting “a  $\lambda_{\text{max}}$  of light emitting”. The examiner suggests changing “emitting” to --emission--.

5. With respect to present claims 6-8 and the prior art applied below:

Claim 6 recites “consists essentially of”. This language limits the scope of the claim to the specified materials and those that do not materially affect the basic and novel characteristics of the claimed invention. In the present case, the examiner does not interpret this language as excluding any particular materials from the layer and/or as requiring the layer to containing any specific minimum amount of the light-emitting material. The only specific property that the claimed device must have is the property of light emission. As long as any additional materials do not result in a device incapable of emitting light, the examiner does not consider those additional materials to be excluded by the language of claim 6.

Claims 7 and 8 recite “formed by a coating process”. This recitation is a process limitation in a product claim. Product-by-process claims are not limited to the process step(s) recited, only to the structure implied by the process.

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

7. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Maestri et al., "Photochemistry and Luminescence of Cyclometallated Complexes", pp. 1-68 in *Advances in Photochemistry*, Vol. 17 (1992).

See pages 1-68 in their entirety and, in particular, see pp. 3-4, 12-13, 19, 21-23, 29-30 and 35-39. The prior art discloses several iridium complexes that meet the limitations of the light-emitting material of present claim 1. For example,  $[\text{Ir}(\text{bhq})_2(\text{phen})]^+$  and  $[\text{Ir}(\text{bhq})_2(\mu\text{-Cl})]_2$  are iridium complexes having a partial structure represented by present formula (2).  $[\text{Ir}(\text{ptpy})_2(\mu\text{-Cl})]_2$ ,  $[\text{Ir}(\text{mppy})_2(\mu\text{-Cl})]_2$ ,  $[\text{Ir}(\text{ptpy})_2(\text{bpy})]^+$  and  $[\text{Ir}(\text{mppy})_2(\text{bpy})]^+$  are iridium complexes having a partial structure represented by present formula (3).  $[\text{Ir}(\text{ppy})_2\text{Cl}(\text{CO})]$  is an iridium complex having a partial structure represented by present formula (5).

8. Claim 8 is rejected under 35 U.S.C. 102(b) as being anticipated by Baldo et al., "Very high-efficiency green organic light-emitting devices based on electrophosphorescence", pp. 4-6 in *Applied Physics Letters*, Vol. 75, No. 1 (July 1999).

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Baldo et al. disclose an organic light-emitting device comprising a pair of electrodes and, between the pair of electrodes, a layer comprising the orthometalated iridium complex (Ir)ppy<sub>3</sub>. For example, see Figure 1 and the paragraph bridging pages 4 and 5 of the article.

9. Claims 1 and 5-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Thompson et al. (US 2002/0034656 A1).

Thompson et al. disclose several iridium complexes that meet the limitations of the light-emitting material as required by present claims 1 and 5-8. Thompson et al. disclose these complexes for use in a light-emitting device comprising a pair of electrodes and, between the pair of electrodes, at least one layer comprising such a complex. See the whole reference. In particular, see the abstract and Figures 13, 17, 18, 20, 24, 26, 27 and 31. The prior art complexes "mer-Irbq", "BQIr" and "BQIrFA" meet the limitations of a compound having a partial structure represented by present formula (2). The prior art complexes "Ir(3-MeOppy)<sub>3</sub>" and "tpyIrsd" meet the limitations of a compound having a partial structure represented by present formula (3). The prior art complexes "thpyIrsd", "THIr" and "BTHPIr" meet the limitations of a compound having a partial structure represented by present formula (1).

The published application of Thompson et al. claims the benefit under 35 U.S.C. 120 of several prior U.S. applications. Of these prior applications, U.S. Application No. 09/452,346, filed 12/01/99, discloses all of the iridium complexes referenced above and teaches their use in light-emitting devices.



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10. Claims 1 and 5-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Forrest et al (US 6,310,360 B1).

See the whole patent. In particular, see Figure 1, column 9, lines 2-49, c. 13, l. 15-50 and c. 17, l. 9-49. The device of prior art Example 1 anticipates a device of present claim 8.

$\text{Ir(ppy)}_3$  derivatives having alkyl or aryl substituents as taught at c. 17, l. 9-49 anticipate a light-emitting material comprising a compound having a partial structure represented by formula (3) as set forth in present claim 1. Based on Forrest's teachings that these  $\text{Ir(ppy)}_3$  derivatives may be used in place of  $\text{Ir(ppy)}_3$ , it is the examiner's position that a light-emitting device according to present claims 5-8 is also anticipated by the prior art because one of ordinary skill in the art at the time of the invention could at once envisage a light-emitting device such as the device of Forrest's Example 1 in which an alkyl or aryl substituted  $\text{Ir(ppy)}_3$  derivative is used in place of  $\text{Ir(ppy)}_3$ .

11. Claims 1 and 4-9 are provisionally rejected under 35 U.S.C. 102(e) as being anticipated by copending Application No. 09/695,978 which has an inventor in common with the instant application (but a different inventive entity).

Based upon the earlier effective U.S. filing date of the copending application, it would constitute prior art under 35 U.S.C. 102(e), if published under 35 U.S.C. 122(b) or patented. This provisional rejection under 35 U.S.C. 102(e) is based upon a presumption of future publication or patenting of the copending application.

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The formula for Compound (f) on page 51 of the copending application represents a compound having a partial structure represented by present formula (21) as set forth in present claims 1 and 5. Compound (f) further meets the limitations of a compound represented by formula (23) as set forth in claim 4 wherein each of  $m^1$  and  $m^2$  represents 0, each of  $R^{13}$  and  $R^{15}$  represents a substituent, and  $R^{14}$  represents a hydrogen atom.

Example 10 as described on page 56 of the copending application provides an organic light-emitting device comprising a pair of electrodes and, between the pair of electrodes, a layer comprising Compound (f). The device of Example 10 emits red light (and thus must inherently have a  $\lambda_{max}$  of light emission of 590 nm or more) and has an external quantum efficiency of 12.0%. The device of Example 10 meets the limitations of a device as claimed in present claims 5-9.

This provisional rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the copending application was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

This rejection may not be overcome by the filing of a terminal disclaimer. See *In re Bartfeld*, 925 F.2d 1450, 17 USPQ2d 1885 (Fed. Cir. 1991).

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 2, 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thompson et al. (US 2002/0034656 A1) as applied above to claims 1 and 5-8, and for the further reasons set forth below.

Thompson et al. do not provide a specific example of an iridium complex meeting the limitations of present claim 2 or present claim 4.

Thompson et al. do not provide a specific example of a device meeting the limitations of present claim 9.

Thompson et al. teach various means to improve electroluminescent device efficiency. Thompson et al. teach fine tuning of color emission by appropriate selection of ligands. Thompson et al. also disclose ligands similar to those required for the complexes of present claims 2 and 4. For example, see the abstract, Figure 49, and paragraphs [0015], [0020], [0030]-[0046], [0111], [0169]-[0171], [0183] and [0241]-[0250]. Also see the Figures referenced in the rejection of claims 1 and 5-8 which show different emission  $\lambda_{max}$  values for different complexes.

It would have been within the level of ordinary skill of a worker in the art at the time of the invention, guided by the teachings of Thompson et al. regarding improvement in device efficiency and fine tuning of color emission, to select appropriate light-emitting complexes and to determine suitable and optimum layer combinations to provide as efficient a device as possible

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having a  $\lambda_{\text{max}}$  of light emission suitable for the intended use. For uses where a device emitting red light is desirable, one of ordinary skill in the art would be motivated to select a light-emitting complex having a  $\lambda_{\text{max}}$  of light emission of 590 nm or greater. One of ordinary skill in the art would have been motivated to optimize device efficiency for the *prima facie* benefits of optimum device efficiency.

Further with respect to claims 2 and 4, the arylquinolines disclosed in Figure 49 (which were also disclosed in Thompson's priority application 09/452,346) are position isomers of the quinoline derivative ligand of compounds represented by present formulae (21), (23) and (24). It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to make iridium complexes having ligands similar to those disclosed in the prior art with the expectation that such complexes would also be light-emitting and would be useful in the manufacture of organic light-emitting devices.

Further with respect to claim 9, while the claim requires an external quantum efficiency of 5% or more, applicants disclose that 5% external quantum yield is achieved in "conventional" light-emitting devices (see p. 2, l. 17-20 of the present specification).

14. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (703) 308-4413. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

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The current fax numbers for Art Unit 1774 are (703) 872-9311 for official after final faxes and (703) 872-9310 or (703) 305-5408 for all other official faxes. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (703) 872-9041.)

MRY  
06/25/02

*Marie R. Yamnitzky*

MARIE YAMNITZKY  
PRIMARY EXAMINER

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